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John L. Bedford, Frederick M. Davenport. (New York: Rand School. 1916. Pp. 48. 10c.)

The thirty-second annual report of the work of the Fabian Society for the year ended 31st March, 1915. Also the rules of the Society. (London: Fabian Soc. 1915. Pp. 25.)

Statistics and Its Methods

Modes of Research in Genetics. By RAYMOND PEARL. (New York: The Macmillan Company. 1915. Pp. vii, 182. \$1.25.)

This book has a distinct message not only for general biologists, biometricians (the followers of Galton and Pearson), but for students of statistical method, whether economists, sociologists, or professional statisticians.

To the general biologist the author says, in effect: Your attitude toward biometry is in need of alteration in one important particular. Under the leadership of Galton and Pearson the biometricians have devised a unique apparatus for scientific research—a set of mathematical instruments of the greatest efficiency and value, which are a necessary adjunct to the experimental method in any branch of science. You have, on the whole, set a low value on the theoretical conclusions of the biometric school; and your scepticism is well grounded. But the fact that the new methods, the mathematical tools of this group of enthusiasts, have not in the hands of their creators produced results of great biological significance should not blind you to the merits of these tools as essential adjuncts of the experimental method of research. Mendelism itself, as a method of research, is essentially statistical. Where quantitative problems are to be handled you can not afford to overlook the most perfect equipment for handling them.

To the biometrician the message runs as follows: You have given to scientific research a tool of the very greatest value. But you have not used well your own invention. You have unwittingly employed biological assumptions as the basis of your reasoning, and these assumptions have been unsound. As a result "the whole superstructure of the biometric treatment of inheritance is reared upon a fundamental biological error. When the significance and consequences of this initial error are perceived it is seen at once that the whole reasoning, so far as it concerns heredity, falls to the ground" (p. 68).

To the general student of statistical method the message is

somewhat as follows: You have had presented to you mathematical implements of precision and power. Gifted mathematicians, the very inventors of these implements themselves, have erred in their use. The temptations to their misuse are highly seductive. Nothing as to causation is to be proved by measuring two variables and calculating their coefficient of correlation. Mere correlation affords no proof either of the direction of causation or of the methods or mechanism by which it works. Knowledge of this sort must be derived from information from outside the table. *This warning is in practice exceedingly hard to remember.* Moreover, in the mere setting of your problem you are likely to conceal presuppositions which vitiate your whole reasoning. Eternal vigilance is the price of safety.

The above free interpretation seems to the reviewer to give an idea of the essential message of the first three chapters of the book. There is much more, both of biology and of statistical method, to be gleaned from the book itself than can possibly be indicated in a scanty summary.

The author is the biologist of the Maine Agricultural Experiment Station. He is a delightfully clear thinker, and an extremely interesting and lucid writer. He has much to say to the biological fraternity which the present writer can not judge with any authority. It would seem clear, however, from this book that the general biologists have been guilty of a curious neglect of the biometric tool-chest. In pointing this out our author assumes no air of superior perspicacity. His tone is modest, sincere, and utterly incapable of giving offense.

So far the book is a study of the biometric equipment as a set of implements for research. In chapter 4 the author essays an experiment of his own in biometrics. (By no means his first, for his researches in the study of heredity are well-known.) He formulates a definition of inbreeding and devises a coefficient for its measurement. To the layman the experiment seems highly successful, so much so that one is at a loss to understand the looseness of the term inbreeding as used hitherto by biologists and breeders. Pearl's mathematical elegance stands out in vivid contrast against the current looseness of expression and thought, and beautifully demonstrates the utility of the biometric mode of formulation for which the author has been arguing.

The concluding chapter on Genetics and Breeding raises the question of the practical significance to the breeder of recent

study of the laws of heredity. A captious critic might complain that this chapter detracts from the unity of the book as a whole. This would be ungracious criticism, however, for one striking feature of the book is to be found in the fact that the other four chapters, though printed originally as separate papers, are combined here with apparently little change into a highly unified whole.

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The Wealth and Income of the People of the United States. By WILLFORD ISBELL KING. (New York: The Macmillan Company. 1915. Pp. xxiv, 278. \$1.50.)

The author undertakes to study the distribution of wealth quantitatively, as it should be done, instead of with reference merely to the traditional factors of production or merely to pecuniary values. Following some introductory matter is a chapter (ch. 3) entitled "Changes in the social wealth of the American people," which deals with evidences of the growth of material welfare. Next is a chapter on the "Distribution of wealth among families." After defining income, the author deals in succession with the national income and the industries that produce it (ch. 6), its distribution among the factors of production (ch. 7), the share of corporations in the national product (ch. 8), and, finally, the distribution of income among families (ch. 9). The book contains numerous tables and diagrams—59 of the former, as listed, and 29 of the latter.

A book dealing scientifically with the amount and actual distribution of wealth and income is much needed. The task is exacting in regard to both economics and statistics. Dr. King's achievement is not without merit. But the conception of the book preceded the date of the preface by only a year and a half, and its purpose is popular presentation—"an impressionistic picture," the preface says—rather than the advancement of scientific knowledge. In the existing state of the statistics required, however, the work must be judged mainly from the latter viewpoint.

Let us consider economic matters first. The place assigned to free goods as a component of national wealth and the statistical review of the natural resources of this country contribute to adequate ideas on these subjects. A more critical handling of census data, especially of "capital," is perhaps not required by the plan